

1 COOLANT TRANSFER MACHINE FOR  
2 AUTOMOTIVE VEHICLE & METHOD

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4 RELATED PATENT APPLICATIONS & INCORPORATION BY REFERENCE

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6 This application is a continuation application of utility patent  
7 application Serial No. 10/140,047, entitled "Coolant Transfer Machine  
8 For Automotive Vehicle & Method," filed May 7, 2002, which is based  
9 on U. S. provisional patent application Serial No. 60/289,483, entitled  
10 "Coolant Transfer Machine For Automotive Vehicle & Method," filed  
11 May 8, 2001. If any conflict arises between the disclosure of the  
12 invention in this application and that in the related provisional  
13 application, the disclosure in this utility application shall govern.  
14 Moreover, the inventors incorporate herein by reference any and all U.  
15 S. patents, U. S. patent applications, and other documents cited or  
16 referred to in this application or cited or referred to in the U. S. patents  
17 and U. S. patent applications incorporated herein by reference.

18  
19 DEFINITIONS

20  
21 The words "comprising," "having," "containing," and "including,"  
22 and other forms thereof, are intended to be equivalent in meaning and  
23 be open ended in that an item or items following any one of these  
24 words is not meant to be an exhaustive listing of such item or items, or  
25 meant to be limited to only the listed item or items.

26  
27 BACKGROUND OF THE INVENTION

28  
29 Servicing of automotive vehicles typically requires periodic

1 replacement of the coolant in the cooling system for the vehicle's  
2 engine. Fluid transfer machines such as, for example, illustrated in U.  
3 S. Patent Nos. 4,782,689; 4,888,980; 5,573,045; 5,615,716; 6,135,136;  
4 6,152,193; 6,161,566; and 6,213,175B1, are sometimes used to transfer  
5 the used coolant to a storage vessel while replacing this used coolant  
6 with new coolant. Many coolant transfer machines employ a system  
7 relying on the vehicle's engine to provide the power to effect the  
8 coolant transfer. In some instances this limits the speed at which the  
9 transfer can be accomplished. Other coolant transfer machines shut  
10 the engine off and employ a different system relying on external means  
11 for providing the power to transfer coolant.

## 12 13 SUMMARY OF THE INVENTION 14

15 This invention has several features. Without limiting the scope of  
16 this invention as expressed by the claims that follow, its more  
17 prominent features will now be discussed briefly. After considering  
18 this discussion, and particularly after reading the section entitled,  
19 "DETAILED DESCRIPTION," one will understand how the features of this  
20 invention provide its benefits, which include, but are not limited to,  
21 rapid transfer of coolant, a hybrid system that allows the user to select  
22 between two different systems the one best suited for the vehicle being  
23 serviced, avoiding creating "hot spots" in the engine's cooling system,  
24 and economies in that the hybrid system is contained within a single  
25 housing and shares common components.

26 In accordance with this invention, coolant is transferred to and  
27 from an automotive engine having a radiator in communication with  
28 the engine using a machine that carries a new fluid container that  
29 holds new coolant and a used fluid container that holds used coolant

1 from the engine. The first feature of the coolant transfer machine of  
2 this invention is that it includes two fluid transfer systems: A first fluid  
3 transfer system that sequentially first removes at least a substantial  
4 portion of used coolant from the engine and collects in the used fluid  
5 container the used coolant as the used coolant is being removed and  
6 then replaces the removed used coolant with new coolant from the new  
7 fluid container. And a second fluid transfer system that  
8 simultaneously displaces at least a substantial portion of used coolant  
9 in the engine with new coolant from the new fluid container and  
10 collects the displaced used coolant in the used fluid container. The  
11 engine is not operational while the first fluid transfer system is  
12 transferring coolant and the engine is operational while the second  
13 fluid transfer system is transferring coolant. A manually operable  
14 switch is used to select the fluid transfer system to be used based on  
15 the type of service to be provided: Namely, a quick service where the  
16 first fluid transfer system is typically used, or more complete service  
17 that requires more time where the second fluid transfer system is  
18 typically used, or a service that depends on the type of individual  
19 engine being serviced, where either the first or second fluid transfer  
20 system may be used. Optionally, the second fluid transfer system  
21 includes a closed loop circuit that recycles fluid between the radiator  
22 and engine rather than transferring used fluid from the engine to the  
23 used fluid container and new fluid from the new fluid container to the  
24 radiator. The containers each include a sensor. The sensor in the new  
25 fluid container initiates the closed loop circuit when the sensor detects  
26 that the new fluid container is empty or near empty. The sensor in the  
27 used fluid container initiates the closed loop circuit when the sensor  
28 detects that the used fluid container is full or near full.

29 The second feature of this invention is that the first fluid transfer

1 system includes a first adapter that is first manually inserted into an  
2 opening in the radiator upon removal of a radiator cap covering this  
3 opening. This first adapter may be in the form of a plug that is  
4 inserted into the opening. The adapter is then manually connected to  
5 the used fluid container to establish communication between the  
6 radiator and the used fluid container to transfer the used coolant from  
7 the engine to the used fluid container via the radiator. After  
8 withdrawing used coolant from the radiator, the first adapter is  
9 manually connected to the new fluid container to establish  
10 communication between the radiator and the new fluid container to  
11 transfer new coolant to the engine via the radiator. In an alternate  
12 embodiment of the first fluid transfer system, the engine is placed in  
13 communication with the containers via a connector attached to a  
14 radiator over flow member. A first pump is manually placed in  
15 communication with the used fluid container and the radiator to pump  
16 the used coolant from the engine through the radiator and into the  
17 used fluid container to create a reduced pressure in the engine. Upon  
18 establishing communication between the new fluid container and the  
19 radiator, the reduced pressure in the engine sucks new fluid into the  
20 radiator to replace the removed used coolant with new coolant.

21 The third feature of this invention is that the second fluid  
22 transfer system includes a pair of adapters. The coolant in the engine  
23 flows from the engine into the radiator through a manual detachable  
24 member such as, for example, a rubber tube. Upon manually  
25 detaching the detachable member, the pair of adapters is attached to  
26 provide access of coolant to the radiator and the engine. One adapter  
27 establishes communication with the new fluid container to transfer new  
28 coolant to the engine via the radiator. The other adapter establishes  
29 communication with the used fluid container to collect used coolant

1 being displaced by the new coolant from the new fluid container.

2 The fourth feature of this invention is the use of hoses to  
3 establish communication between the containers and the engine  
4 through the adapters or the connector attached to the radiator over  
5 flow member. A drain hose is placed in communication with the used  
6 fluid container to transfer the used coolant from the engine to the used  
7 fluid container. And a supply hose is placed in communication with  
8 the new fluid container to transfer new coolant to the engine after  
9 transfer of the substantial portion of the used coolant from the engine.

10 The hoses are manually connected and disconnected to individual  
11 adapters or the connector attached to a radiator over flow member  
12 depending on which fluid transfer system is being used. These hoses,  
13 adapters, and connector attached to the radiator over flow member  
14 employ conventional quick connect-disconnect connectors. These  
15 conventional quick connect-disconnect connectors each have one  
16 coupling component attached to a hose and another coupling  
17 component attached to an adapter or the connector for the radiator  
18 over flow member. These coupling components interact very quickly  
19 and have interlocking elements that, when the coupling components  
20 are connected or disconnected, maintain substantially the reduced  
21 pressure in the engine, preventing air at atmospheric pressure from  
22 entering the radiator, engine or either fluid transfer system.

23 The fifth feature of this invention is that the machine has a  
24 housing with a control panel and a base that supports the new fluid  
25 container and the used fluid container. The containers are free-  
26 standing and capable of being individually removed from the base and  
27 replaced. The first and second fluid transfer systems are within this  
28 housing and the drain hose, supply hose, the first pump, and a second  
29 pump along the supply hose are common components of both systems.

1 The first pump is operated only when the first fluid transfer system is  
2 operational and second pump is operated only when the second fluid  
3 transfer system is operational.

4 The sixth feature of this invention is that the first and second  
5 fluid transfer systems have a common waste removal system operable  
6 when said first and second fluid transfer systems are disconnected  
7 from the engine. This common waste removal system transfers to a  
8 waste storage container used coolant in the used fluid container.

9 This invention also includes a method of transferring coolant to  
10 and from an automotive engine having an engine cooling system  
11 including a radiator. This method includes the steps of:

12 (a) providing a new fluid container holding new coolant and a  
13 used fluid container for holding used coolant from the engine,

14 (b) providing a first fluid transfer system that sequentially first  
15 removes at least a substantial portion of used coolant from the engine  
16 and collects in a used fluid container the used coolant as said used  
17 coolant is being removed and then replaces said removed used coolant  
18 with new coolant from a new fluid container, said engine being non-  
19 operational when coolant is being transferred,

20 (c) providing a second fluid transfer system that simultaneously  
21 displaces at least a substantial portion of used coolant in the engine  
22 with new coolant from the new fluid container and collects the  
23 displaced used coolant in the used fluid container, said engine being  
24 operational when coolant is being transferred, and

25 (d) selecting one of said fluid transfer systems to transfer coolant  
26 based on the type of service to be provided.

## DESCRIPTION OF THE DRAWING

The preferred embodiments of this invention, illustrating all its features, will now be discussed in detail. These embodiments depict the novel and non-obvious coolant transfer machine, systems and method of this invention as shown in the accompanying drawing, which is for illustrative purposes only. This drawing includes the following figures (Figs.), with like numerals indicating like parts:

Fig. 1 is a schematic diagram of the hybrid coolant transfer machine of this invention showing the vehicle's engine off and the first fluid transfer system in the evacuation mode wherein used coolant is transferred from the engine's cooling system to a used fluid container (Used Fluid Tank T1).

Fig. 2 is a schematic diagram of the hybrid coolant transfer machine shown in Fig. 1 and the first fluid transfer system in the fill mode wherein new coolant is transferred to the engine's cooling system from a new fluid container (New Fluid Tank T2).

Fig. 2A is a schematic diagram of an alternate embodiment of the hybrid coolant transfer machine of this invention showing the vehicle's engine off and the first fluid system in the evacuation mode wherein used coolant is transferred from the engine's cooling system to a used fluid container via a radiator over flow tube.

Fig. 3 is a schematic diagram of the hybrid coolant transfer machine of this invention showing the vehicle's engine on and the second fluid transfer system operational wherein used coolant is displaced from the engine's cooling system and transferred a used fluid container as new coolant is pumped into the engine's cooling system from the new fluid container.

1 Fig. 4 is a schematic diagram of the hybrid coolant transfer  
2 machine shown in Fig. 3 with the vehicle's engine on and the second  
3 fluid system operational and in a loop mode.

4 Fig. 5 is a schematic diagram of the hybrid coolant transfer  
5 machine shown in Figs. 1 and 3 with the vehicle's engine disconnected  
6 from the machine and used coolant in the used fluid container being  
7 transferred to a waste storage container.

8 Fig. 6 is a perspective view of the hybrid coolant transfer  
9 machine of this invention showing the machine's housing which  
10 includes the first and second fluid transfer systems depicted in Figs. 1  
11 and 3.

12 Fig. 7 is an enlarged, fragmentary view of the control panel  
13 displayed on the outside of the cover of the housing shown in Fig. 6.

14 Fig. 8 is a perspective view of the side of the housing shown in  
15 Fig. 6.

16 Fig. 9 is a rear view of the housing shown in Fig. 6.

17 Fig. 10 is a plan view of an internal wall of the housing cover  
18 showing the backside of the control panel.

19 Fig. 11 is a plan view of the exterior top of the housing platform  
20 showing various components of the hybrid coolant transfer machine of  
21 this invention.

22 Fig. 12 is a schematic wiring diagram of the control circuit for the  
23 hybrid coolant transfer machine of this invention.

## 24 25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

26  
27 As illustrated in Figs. 1 through 5, the hybrid coolant transfer  
28 machine 10 of this invention employs two fluid transfer systems, the  
29 Evac system A (Figs. 1, 2 and 2A) adapted to be operated when the



1 vehicle's engine 12 is not operating and the Flush system B adapted to  
2 be operated when the vehicle's engine is operating (Figs. 3 and 4). The  
3 components of both fluid transfer systems A and B are mounted to, or  
4 contained within, a housing 14 shown in Figs. 6, 8 and 9. The housing  
5 14 includes a cover 14a with hinges 14b, rectangular base 14c, and,  
6 centrally positioned on the base, a pedestal (not shown) that extends  
7 upward in a vertical orientation to provide a partition. As best shown  
8 in Fig. 2, fixedly attached to the top of the pedestal 14 is a flat,  
9 rectangular, planar platform P oriented horizontally. This platform P is  
10 used to support components of the fluid transfer machine 10. The  
11 structural features of the housing 14 are discussed in detail in U. S.  
12 provisional patent application Serial No. 60/266,399, filed February 2,  
13 2001, and U. S. utility patent application Serial No. 10/059,868, filed  
14 January 29, 2002, based on the provisional patent application Serial  
15 No. 60/266,399, both assigned to MOC Products Company, Inc., the  
16 assignee of this utility patent application.

17 In accordance with this invention, both the systems A and B  
18 include the following common components: Used Fluid Tank T1, New  
19 Fluid Tank T2, solenoid actuated Valve #1, solenoid actuated Valve #2,  
20 a 30 Micron Filter F1, 12 Volt Pump P1, Check Valve C1, Flow Indicator  
21 F2, Pressure Gage G1, Drain Hose H1, Supply Hose H2, and a control  
22 panel 100 (Fig. 7) displayed on the upper, front exterior of the cover  
23 14a of the housing 14. As best shown in Fig. 7, the control panel 100  
24 includes a flow indicator display 102, a system pressure gauge display  
25 104 (the system pressure gauge G1 is downstream of the flow indicator  
26 F1), a main switch 20 with its control knob 20a on the panel 100, a  
27 service complete indicator light L1, a used fluid tank full light L2, top  
28 off pump control button B1, and a mechanical toggle switch 106 for  
29 actuating an Air Pump P2. (An electrical pump may be used in place of

1 the Air Pump P2 and an electrical switch used in place of the toggle  
2 switch 106 to operate a relay for actuating the electrical pump.) The  
3 hoses 108 shown in Figs. 6, 10 and 11 are internal plumbing hoses  
4 connecting the components of the systems A and B together as  
5 depicted schematically in Figs. 1 through 5. The system A also includes  
6 a solenoid actuated Air Valve #4, and a Radiator Hose Adapter or plug  
7 26. The system B also includes a solenoid actuated Valve #3, and a  
8 pair of adapters 16 and 18 that are disclosed in detail in U. S. utility  
9 patent application Serial No. 09/850,831, filed in the names of Michael  
10 J. Camacho and Carl Brod on May 8, 2001, and entitled "Adapter For A  
11 Coolant Transfer Machine, Methods Of Transferring Coolant & Kit," and  
12 assigned to MOC Products Company, Inc., the assignee of this utility  
13 patent application.

14 As depicted in Fig. 1, when using the system A, the engine 12 is  
15 shut off so that it is non-operational and the knob 20a of the main  
16 switch 20 on the control panel 100 (Fig. 7) is turned manually to the  
17 position "Evac Service" to energize the solenoid controlled Air Valve #4  
18 to place the Air Pump P2 through the Valve #4 in communication with  
19 a source of air under pressure (Shop Air) to provide air to actuate the  
20 Air Pump. As shown in Fig. 9, there is a port 110 that enables an air  
21 line 22 from the source of air (Shop Air) to be connected to the  
22 machine 10. There are also jumper cables 112 attached to the rear  
23 exterior wall of housing 14 to allow the machine's control circuit 114  
24 (Fig. 12) to be connected to the battery B1 of the vehicle being  
25 serviced.

26 The plug 26 and the Drain Hose H1 are connected by a  
27 conventional two component quick connect-disconnect coupling 24. A  
28 suitable two component quick connect-disconnect coupling 24 may be  
29 obtained from, Rectus GMBH, a German company, dba Oboc with office

1 in Sparta, New Jersey. The terminal end of the Drain Hose H1 has one  
2 component 24a and the plug 26 has extending from it the other  
3 component 24b. The Supply Hose H2 has a component 24c connected  
4 to its terminal end for connecting the Supply Hose H2 as illustrated in  
5 Fig. 2. The plug 26 is inserted into a top opening 25a in the radiator 25  
6 that is normally closed by a radiator cap 28a (Fig. 2A). When using  
7 system A, the radiator cap 28a is removed to uncover this opening 25a  
8 prior to insertion of the plug 26. In an alternate embodiment shown in  
9 Fig. 2A, the radiator cap 28a is not removed and the Drain Hose H1 is  
10 connected to a Radiator Over Flow Tube 116 via a detachable member  
11 30 having at its terminal end the component 24b for connection to the  
12 component 24a.

13 With the knob 20a of the main switch 20 on the control panel  
14 100 (Fig. 7) turned to the "Evac Service" position, Relays R1, R2, R3,  
15 and R4 in the control circuit 114 are energized so that the Valves #1,  
16 #2, #3 and #4 are in position shown in Fig. 1 to enable used coolant to  
17 flow from the engine cooling system, the radiator 24, hoses 27 and 28,  
18 the engine's water pump 29, and the engine's internal cooling  
19 passageways (not shown) via the plug 26, the Drain Hose H1, and  
20 Valves #1 and #2 into the Used Fluid Tank T1. The Valves #1, #2, and  
21 #3, are located within the housing 14 as shown in Fig. 11 on the flat,  
22 rectangular, planar, horizontal platform P of the housing. The cover  
23 14a is attached to the platform P by hinges 14b. This platform P is also  
24 used to support the Air Pump P2, 12 Volt Pump P1, a Filter Housing  
25 120 for the 30 Micron Filter F1, and at least some of the components of  
26 the control circuit, for example, the relays R1, R2, R3, and R4. As  
27 shown in Fig. 11, these components may be accessed by raising the  
28 housing cover 14a.

29 The open Valve #4 allows air under pressure to flow through the

1 air line 22 to the Air Pump P2 which pumps the used coolant from the  
2 engine cooling system into the Used Fluid Tank T1. This reduces the  
3 pressure within the engine's cooling system. Depending on the type of  
4 vehicle being serviced from about 20 to about 80, or even greater,  
5 volume percent of the coolant in the engine cooling system is  
6 transferred into the Used Fluid Tank T1. The technician may access the  
7 engine's cooling system prior to adding new coolant, for example, to  
8 replace a thermostat. If this was done, the engine's cooling system  
9 would be at atmospheric pressure. In such a case, after accessing the  
10 engine's cooling system to replace the thermostat, the technician would  
11 again reconnect (if disconnected) the Drain Hose H1 as shown in Fig. 1  
12 and turn the main switch 20 to the Evac Service position to again  
13 remove some more used coolant and reduce the pressure in the  
14 engine's cooling system. The Drain Hose H1 is now disconnected and  
15 the Supply Hose H2 connected as shown in Fig. 2.

16 As illustrated in Fig. 2, upon completion of removal of used  
17 coolant from the engine cooling system, the knob 20b of the main  
18 switch 20 is turned to its OFF position and the Drain Hose H1 is  
19 disconnected from the plug 26 by detaching the coupling component  
20 24a from the coupling component 24b and the coupling component  
21 24c on the end of the Supply Hose H2 is attached to the coupling  
22 component 24b. The quick connect-disconnect couplings components  
23 24a and 24b and 24c all close immediately upon being disconnected.  
24 Consequently, the use of a two component quick connect-disconnect  
25 coupling 24 avoids introducing air into the cooling system upon  
26 disconnecting the Drain Hose H1 and connecting the Supply Hose H2,  
27 and the reduced pressure is maintained within the engine's cooling  
28 system.

29 The new (unused) coolant is fed from the New Fluid Tank T2 via

1 the Supply Hose H2 through the 30 Micron Filter F1, the 12 Volt Pump  
2 P1, the Check Valve C1, the Flow Indicator F2, a passageway 26a  
3 (shown in dotted lines) in the plug 26 into the radiator 25 though the  
4 radiator opening 25a. Because of the reduced pressure within the  
5 engine's cooling system, the new coolant is simply sucked into the  
6 engine's cooling system. The new coolant flows through the 12 Volt  
7 Pump P1 under the influence of the reduced pressure in the engine's  
8 cooling system. This avoids pulling air into the engine's cooling system  
9 and "hot spots" are avoided. The 12 Volt Pump P1 is only energized by  
10 the technician depressing the top off pump control button B1 shown on  
11 the control panel 100 (Fig. 7). Both the Used Fluid Tank T1 and New  
12 Fluid Tank T2 each have Level Indicators 122 that provide a visual  
13 indication of the liquid level in a tank. The technician by observing  
14 the liquid levels in each of these tanks can determine how much  
15 coolant has been removed from the engine's cooling system, and how  
16 much new coolant has been added. If all the used coolant has not been  
17 replaced with new coolant by simply sucking new coolant into the  
18 engine's cooling system under the influence of the reduced pressure  
19 within the engine's cooling system, the top off pump control button B1  
20 is actuated to energized the 12 Volt Pump P1 to add more new coolant  
21 to the cooling system until all the withdrawn used coolant has been  
22 replaced. When the engine cooling system is filled with new coolant,  
23 the Supply Hose H2 is disconnected by detaching the coupling  
24 components 24c and 24b and removing the plug 26 and replacing the  
25 radiator cap 28a.

26 As depicted in Fig. 3, when using the system B, the engine 12 is  
27 maintained turned on so that it is operational and the knob 20a of the  
28 main switch 20 on the control panel 100 (Fig. 7) is turned manually to  
29 the "Flush Service" position to actuate the 12 Volt Pump. System B is

1 based on a displacement principal wherein the new coolant pushes the  
2 used coolant from the engine's cooling system. The radiator cap 28a  
3 remains in place. Prior to activating the system B, one end of the hose  
4 27 is disconnected from the radiator 25 and adapters 10a and 10b are  
5 connected as shown in Fig. 3 to place the engine's cooling system in  
6 communication with the Used Fluid Tank T1 and New Fluid Tank T2  
7 for transfer of used coolant from the engine cooling system to the Used  
8 Fluid Tank T1 and new coolant from the New Fluid Tank T2 to the  
9 engine cooling system. Although hose 27 is shown as disconnected, the  
10 hose 28 could be disconnected instead of hose 27, and the Supply Hose  
11 H2 could be connected to the engine 12 and the Drain Hose H1  
12 connected to the radiator 25. New coolant displaces used coolant,  
13 flowing from the New Fluid Tank T2 into the radiator 25 through the  
14 Supply Hose H2 via the 30 Micron Filter F1, the 12 Volt Pump P1, the  
15 Check Valve C1, the Flow Indicator F2, the adapter 10a, and a  
16 replacement conduit 80 placing the radiator 25 in communication with  
17 the adapter 10a. Used coolant flows from the engine 12 into the Used  
18 Fluid Tank T1 through the Drain Hose H1 via the open Valves #1 and  
19 #2.

20 As illustrated in Fig. 4, system B may be operated in a loop mode  
21 whereby the used coolant circulates via a connector tube 50 between  
22 the Drain Hose H1 and Supply Hose H2. In this loop mode, coolant is  
23 continually recycled between the engine 12 and the radiator 25 via the  
24 hose 27, the adapter 10b, the Drain Hose H1, the Valve #1, the  
25 connector tube 50, the Flow Indicator F2, the Supply Hose H2, the  
26 adapter 10a, and the replacement conduit 80. There is a sensor 60  
27 (Figs. 1, 3, and 12) located near the top of the Used Fluid Tank T1 and  
28 a sensor 62 (Figs. 1, 3, and 12) near the bottom of the New Fluid Tank  
29 T2, which, respectively, detect when the Used Fluid Tank T1 is almost

1 full and when the New Fluid Tank T2 is almost empty. The sensors 60  
2 and 62 are float switches. When either of these conditions is detected  
3 by either one of these sensors 60 or 62, the system B is switch to the  
4 loop mode. The system B is also switch to the loop mode when the  
5 service is completed by displacing the maximum amount of used  
6 coolant in the engine's cooling system. When system B is in the loop  
7 mode, a buzzer 124 (Figs. 10 and 12) is activated to provide an audio  
8 alarm and the service complete light L1 on the control panel 100 is  
9 illuminated.

10 As depicted in Fig. 5, the coolant transfer machine 10 may be  
11 operated in a Drain Used Fluid Mode. In this mode, the Drain Hose H1  
12 and Supply Hose H2 are disconnected from the engine 12 and the  
13 Supply Hose H2 is connected by the coupling component 24c to a  
14 coupling component 24d on one end of a conduit 52 having another  
15 end connected to a Waste Fluid Container. Upon actuating the Toggle  
16 Switch, the pressurized air is supplied to the Air Pump, activating this  
17 pump. This causes used coolant in the Used Fluid Tank T1 to flow via  
18 the conduit 56 through the Valve #3, conduit 57, the Air Pump,  
19 conduit 58, the Valve #2, conduit 59 to the inlet of the Flow Indicator  
20 and out the outlet of the Flow Indicator through the Supply Hose H2  
21 and conduit 52 into the Waste Fluid Container.

22 The advantage of employing both systems A and B in the hybrid  
23 coolant transfer machine 10 is that the technician using the machine  
24 10 will then have the ability to select the system (A or B) best suited to  
25 service a particular vehicle. With the system A, the technician does  
26 not have to disconnect hose 27 (or the hose 28), but simply replaces  
27 the radiator cap 28a. This saves time. But with some vehicles, it may  
28 be more advantageous to use system B, because a greater displacement  
29 of used coolant is achieved than would be possible using system A.